ORIGINAL ARTICLE

Wake up Test in Patients Undergoing Harrington Instrumentation: Comparison of two Techniques

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ABSTRACT

Aim: To compare two techniques for wake up test in patients undergoing Harrington instrumentation.
Setting: Department of Anaestheisa, Ghurki Trust Teaching Hospital, Lahore
Methods: Both male and female patients aged 13 to 25 years, having ASA status I and II undergoing Harrington instrumentations and who gave informed consent were included. Patient having mental retardation, or having neuromuscular disease were excluded. The patients were given instructions regarding wake up test that they would have to squeeze the hand of anaesthesiologist in their fingers and would have to move their toes intraoperatively when given the command.
Results: The results were obtained by analysis of data in SPSS version 15.0 and independent samples t test was applied to compare the results.
Conclusion: With O_2 - N_2O - propofol infusion the arousal time was less as compare to O_2 - N_2O - midazolam infusion technique.
Keywords: Harrington instrumentation, wake up, comparison

INTRODUCTION

Spinal cord damage during Harington instrumentation needs earliest detection to avoid permanent paralysis[1]. Among the different intraoperative monitoring approaches for the assessment of spinal cord integrity, wake up test is easier to perform, better and a valuable monitoring way[2].

Somatosensory evoked potentials are also used for assessment of spinal cord function but this method is expensive and needs complex interpretation[3,4].

In our study we compared O_2-N_2O-midazolam and O_2-N_2O-propofol techniques. The time taken for arousal after discontinuation of anaesthetics was compared. Explicit recall was also ruled out [5,6].

METHODS

Approvals were taken from Medical Ethical Committee of hospitals. Both male and female patients aged 13 to 25 years, having ASA status I and II undergoing Harrington instrumentations and who gave informed consent were included.

The exclusion criteria were the patient having mental retardation, or having neuromuscular disease. The patients were given instructions regarding wake up test that they would have to squeeze the hand of anaesthesiologist in their fingers and would have to move their toes intraoperatively when given the command. All the patients were preoxygenated for 3min. The induction was done on nalbuphine 0.1mg Kg^1I/V, propofol 2mg Kg^1 I/V and atracurium 0.5mg Kg^1 I/V. Tracheal intubation was done. Standard monitoring parameters were applied. In addition, arterial line for continuous blood pressure monitoring, central venous line, nasopharyngeal thermometer, urinary catheter, nasogastric tube were passed and warming blanket was placed under the patient to avoid hypothermia. The oxygen saturation was maintained 96-98%. The end tidal carbon dioxide concentration was 31-37mmHg. The fluid replacement was done with lactated ringer at 7 ml Kg-1 hr-1 and blood transfusion given when the loss was more than 10% of the estimated blood volume.

Randomization of patients (n=60) was done between two groups In the group A (Midazolam group) n=30 the anaesthesia was maintained with midazolam infusion at 0.1 mg $Kg^{-1}min^{-1}$, atracurium 6 ug $Kg^{-1}min^{-1}$. We stopped both infusion 10 min before the wake up test. We reversed the patient with neostigmine 40 ug $Kg^{-1.}$ Nitrous oxide was stopped 5 min before the arousal test time and 100% O^2 was given to patient. Then the patients were given the command to clench anaesthesiologist' hand with their fingers and to move the toes to assess spinal cord integrity.

While in group B (Propofol group) (n=30) anaesthesia was maintained with propofol infusion 25 ug Kg^1min^1 and atracurium infusion 6ug $Kg^{-1}min^{-1}$. Both infusions were stopped and patients were reversed with neostigmine 40ug Kg^{-1} 10 min before the wake up test time. Nitrous oxide was stopped 5 min before the wake up test. The spinal cord function

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was assessed by asking the patient to clench the anaesthesiologist's hand with their fingers and by moving their toes.

In both groups of patients additional bolus of 60 mg propofol was given and anaesthesia was maintained again on already given respective infusion. After the wake up test, patients were again given nitrous oxide 70% and oxygen 30%. At the completion of surgery patients were reversed again and extubated. The patients were questioned about recall and other unpleasant intraoperative experiences after 24 hours.

RESULTS

The results were obtained by analysis of data in SPSS version 15.0 and t test was applied to compare the results. There was no difference between the group A and B regarding age, weight, height, temperature and gender (table.1) P value (> 0.05), Arousal occurred earlier in group B as compared to group A. The arousal time was recorded after the discontinuation of N_2O in both groups. In group B the mean arousal time was 4.73 min that was less than group A mean arousal time i.e., 8.30 min (Table 2). Verbal motor response was obtained much earlier in group B (propofol) as compared to group A (midazolam) and was statistically significant P value (<0.001) (Table 3). Three patients in group A and one patient in group B were unable to move their toes until the traction on the cord was released and motor deficit disappeared afterwards. Furthermore it was observed that the arousal responses of the patients in group B were more brisk and concise than group A. In the recovery room no neurological deficit was seen in any of the patients including those four patients who were unable to move this toes during the wake up test. No untoward reaction was observed except for shivering in 7 patients, 3 from group A and 4 from group B. There were no complaints of intraoperative recall or unpleasant experiences on follows up interview performed after 24 Hours.

Table 1: Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the difference	
		Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper	Lower
Gender	Equal variances assumed	1.069	.305	.528	58	.599	.067	.126	-.186	.319
	Equal variances not assumed			.528	57.914	.599	.067	.126	-.186	.319
Age	Equal variances assumed	.385	.537	-1.768	58	.082	-.900	.509	-1.919	.119
	Equal variances not assumed			-1.768	57.706	.082	-.900	.509	-1.919	.119
Weight	Equal variances assumed	.938	.337	-1.604	58	.114	-1.200	.748	-2.697	.297
	Equal variances not assumed			-1.604	56.620	.114	-1.200	.748	-2.698	.298
Height	Equal variances assumed	1.761	.190	.977	58	.333	.867	.887	-.909	2.642
	Equal variances not assumed			.977	56.553	.333	.867	.887	-.910	2.643
Temp	Equal variances assumed	.734	.395	-.896	58	.374	-.043	.048	-.140	.053
	Equal variances not assumed			-.896	57.479	.374	-.043	.048	-.140	.053

Table 2:

Group	N	Mean	Std. deviation	Std. Error Mean
A	30	8.30	.952	.174
B	30	4.73	.785	.143

Table 3:

Time	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
Equal variances assumes	1.515	.223	15.830	58	.000	3.567	.225	3.116	4.018
Equal variances not assumed			15.830	55.960	.000	3.567	.225	3.115	4.018

DISCUSSION

Spinal cord Harrington instrumentation is associated with high risk of damage to the spinal cord either due to cord traction or vascular compromise[1,2]. Clinically used test to assess the spinal cord damage intra-operatively is the wake up test. For better and more precise assessment of the spinal cord functioning is the neurophysiological monitoring through somatosensory evoked potentials[3,4]. However the combination of both wake up test and somatosensory evoked potentials is more beneficial to assess the damage to spinal cord[5].

The somatosensory evoked potentials tell us about the onset of spinal cord ischemia which is not possible to know with wake up test alone, but the evoked potentials amplitudes are altered due to the anaesthetic agents and their interpretation is quite complex[6,7]. The wake up test is easier to perform and cheaper than the somatosensory evoked potentials. For wake up test to perform we need the anaesthetic regimen that allows rapid recovery of patient from anaesthesia to do the test. The time taken for arousal of the patients is dependent on the effects of anaesthetic agent and muscle relaxants[8]. The anesthetic agent should be short acting with ultra-short context sensitive half time. In target controlled infusion of propofol the recovery is not prolonged if the surgical procedure is not too long as the profofol has high lipid solubility[9]. The arousal time was longer in midazolam group owing to its half-life more than propofol.

In a study done by Ilan Elder et al, the effects of midazolam were reversed by Flumazenil[10]. Although the patient was ready to be aroused in less than 1 minute before the test time but increased incidents of rise in blood pressure were recorded so we did not reverse the patients with the Flumazenil[11,12]and allowed for the spontaneous recovery to occurred.

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